In the Specification

1. Please amend paragraph [0008] of the Published Application with the following amended paragraph:

A first aspect of the invention is a method of performing autocalibration of a single-photon detector arranged to detect weak photon pulses in a quantum key distribution (QKD) system. The method includes performing a detector gate scan by sending a detector gate pulse to the single-photon detector and varying an arrival time T of the detector ~~gating~~ gate pulse over a first select range R1 to determine an optimal arrival time T_{MAX} that corresponds to a maximum number of photon counts N_{MAX} from the single-photon detector. The method further includes performing detector gate dithering <u>of the detector gate pulse</u> by varying the arrival time T over a second select range R2 surrounding T_{MAX} to maintain the photon count at a maximum value.

2. Please amend paragraph [0009] of the Published Application with the following amended paragraph:

A second aspect of the invention is method of <u>operating</u> ~~exchanging a key in~~ a quantum key distribution (QKD) system having a single-photon detector operably coupled to a controller. The method includes sending weak photon pulses between encoding stations in the QKD system, and performing a first detector gate scan. The first detector scan is accomplished by sending a detector gate pulse from the controller to the detector over a range of detector gate pulse arrival times T to establish a first optimal arrival time T_{MAX} corresponding to a first maximum number of photon counts N_{MAX} from the detector. The method also includes terminating the first detector gate scan when the first T_{MAX} is established, and then performing a first detector gate dither. The first detector gate dither is accomplished by the controller altering the arrival time T <u>of the detector gate pulse</u> over a range of arrival times R2 about the first T_{MAX} to maintain either the maximum number of photon counts N_{MAX} or a different maximum number of photon counts N'_{MAX} over the range

R2.

3. Please amend paragraph [0012] of the Published Application with the following amended paragraph:

FIG. 2 is a flow diagram illustrating the autocalibration of the detector through the use of scanning and dithering of the detector gate pulse to optimize the performance of the QKD system of FIG. 1; ~~and~~

4. Please add the following two new paragraphs immediately following paragraph [0012] of the Published Application:

FIG. 3A is a timing diagram showing the variation of the arrival time T of the detector gate pulse to establish the optimum gate timing (i.e., optimal arrival time) T_{MAX};

FIG. 3B is a timing diagram showing the variation in the detector gate pulse width W over a pulse width range RW1 to establish an optimum detector gate pulse width W_{MAX}; and

5. Please amend paragraph [0013] of the Published Application with the following amended paragraph:

~~FIG. 3~~ FIG. 4 is an example plot of a single-photon detector gate scan for a QKD system such as shown in FIG. 1, wherein the Y-axis is the number of photon counts N in a regular time interval, and the X-axis is the timing of the single-photon detector gate associated with the timing (position) of the detector gate pulse; and

6. Please amend paragraph [0031] of the Published Application with the following amended paragraph:

In 304, a detector gate scan is performed. With reference to FIG. 3A, ~~This~~ this involves varying the timing (e.g., the arrival time T) of detector gate pulse S3 over a selected range R1 of timing values to establish the optimal gate timing (arrival time) T_{MAX} that yields the maximum number of photon counts N_{MAX} detected by detector 216. With reference to FIG. 3B, in ~~In~~ an example embodiment of the detector gate scan, the detector gate pulse width W is also optionally varied over a selected pulse width range RW1 to establish the optimum detector gate pulse width W_{MAX}.

7. Please amend paragraph [0032] of the Published Application with the following amended paragraph:

~~FIG. 3~~ FIG. 4 is an example plot of the results of a detector gate scan, wherein the Y-axis is the number N of photon counts obtained during the detector gate interval (i.e., the gate pulse width W). The X-axis represents the relative timing (e.g., arrival time T) of the single-photon detector gate pulse S3, which is varied to achieve maximum number of photon counts N_{MAX}. In the context of the present invention, the maximum number of photon counts N_{MAX} corresponds to optimal system performance because it corresponds to the highest data transmission rates and highest photon sensitivity level vs. timing, with no increase in dark current counts. Likewise, in an example embodiment of the present invention, an optimal optical pulse is one that optimizes the ratio of photon pulses to dark event pulses, while maintaining a smooth single-photon detector response that allows for detector gate dithering, as described below.

8. Please amend paragraph [0033] of the Published Application with the following amended paragraph:

The curve in ~~FIG. 3~~ FIG. 4 is obtained by incrementing the arrival time T of detector gate pulse S3 over a select range R1 of timing values T (X-axis). In an example

embodiment, the arrival time T corresponds to the position of the leading edge of the detector gate pulse relative to a reference, e.g., a clock reference time provided by controller 248.

9. Please amend paragraph [0037] of the Published Application with the following amended paragraph:

With reference again to ~~FIG. 3~~ FIG. 4, four data points d1, d2, d3 and d4 on the curve are highlighted for the sake of illustration. Assume the data point d1 is measured first, then the data point d2 associated with a larger arrival time value T is measured. Since the number of photon counts associated with d2 is less than that associated with d1, the arrival time T is decreased. The number of photon counts for the gate pulse position associated with data point d1 is re-measured. Since the number of photon counts N associated with the second data point at d1 is higher than that associated with data point d2, the arrival time T is further decreased and the photons count is measured. The result is data point d3, which has a higher photon count than for data point d1. The arrival time T is thus decreased again, yield the lower photon count associated with a data point d4. Since this measurement is less than that for d3, the arrival time T of detector gating pulse S3 is increased, but not so much that it returns to the value associated with data point d2.